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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/736,395

12/15/2003

Grant W. McEwan

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12/02/2005

FREESCALE SEMICONDUCTOR, INC.
LAW DEPARTMENT
7700 WEST PARMER LANE MD:TX32/PL02
AUSTIN, TX 78729

EXAMINER

NGUYEN, THANH T

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 12/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/736,395

Applicant(s)

MCEWAN ET AL.

Examiner

Thanh T. Nguyen

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 August 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 20-30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 12 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The limitation “the deposition step uses plasma enhanced chemical vapor deposition” in claim 12 contains subject matter which was not described in the original specification. It is suggested to change to “depositing a dielectric layer by uses plasma enhanced chemical vapor deposition”.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

Claims 1-7, 10-11, 13, 15-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Hashim et al. (U.S. Patent No. 6,287,977).

Referring to figures 3a-10, Hashim et al. teaches a method for preventing corrosion of metal surfaces of a semiconductor device during semiconductor processing, comprising:

Exposing a surface of a metal layer (47a) of the semiconductor device;

Depositing and selectively bonding a sacrificial protective layer (47a') overlying the exposed metal layer (47) surface of the semiconductor device, wherein the sacrificial layer (47a') protects the exposed surface from deleterious effects until subsequent processing of the semiconductor device (see figures 3a); and

Performing a deposition step with the sacrificial protective layer present, wherein the deposition step inherently removes the sacrificial protective layer (see figure 3a-3c, col. 7, lines 16-65).

Regarding to claims 2, metal layer comprises a barrier layer (51) on a copper layer (47) (see figure 3a).

Regarding to claims 3, the metal layer (51) comprises one of a group consisting of tantalum, tantalum nitride, and titanium nitride (see figures 3a, col. 7, lines 50-55).

Regarding to claims 4, deposition step comprises a plasma deposition step (see col. 7, lines 16-65).

Regarding to claims 5, 17, exposing the surface can include a etching process (see col. 6, lines 7-13).

Regarding to claims 6, 16, deposition step comprises electroplating (see col. 10, lines 40-55).

Regarding to claims 7, 15, metal layer comprises copper (47, see col. 6, lines 12-13).

Regarding to claims 10, 18, the metal layer comprises aluminum (see col. 1, lines 25-30).

Regarding to claims 11, 19, the metal layer (47) is under the dielectric layer (45) and the exposing comprises forming an opening (49) I the dielectric layer to expose the surface of the metal layer (47a, see figures 3a-3c).

Regarding to claim 15, the depositing a subsequent layer (51), wherein the step of depositing the subsequent layer is begun without first removing the sacrificial layer (47a') and wherein the sacrificial protective layer is removed prior to completion of the step of depositing (see figure 3a-3c, col. 7, lines 16-65).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8-9, 12, 14, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hashim et al. (U.S. Patent No. 6,287,977) applied to claims 1-7, 10-11, 13, 15-19 above in view of Avanzino et al. (U.S. Patent No. 6,350,687).

Hashim et al. teaches a method for preventing corrosion of metal surfaces of a semiconductor device. However, the reference does not teach depositing and selectively bonding comprises applying a corrosion inhibitor in the vapor phase to exposed metal layer surface to form the sacrificial layer on the exposed metal layer surface, sacrificial layer consist of one monolayer of a vapor corrosion inhibitor, depositing the interlayer by using PECVD. Nevertheless, the process is well known in a semiconductor process.

Avanzino et al. teaches a process of preventing corrosion of metal surface of a semiconductor device by forming a copper layer (13) in the feature (opening) and treating (exposing) the surface of copper by using a vapor corrosions inhibitor (see col. 5, lines 29-38, col. 6, lines 49-65) to form the sacrificial layer (40) on the exposed metal layer surface (see figure 4), and removing the sacrificial layer (40, see figures 4-5), wherein the sacrificial layer (40) has the thickness of 30-100 Å^o (which greater than 1 monolayer, noted a nano layer varies from 5nm to 10 Å^o), depositing the interlayer by using PECVD (see col. 6, lines 8-15).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would the deleterious effects include degraded semiconductor device reliability effects, and forming a sacrificial layer on the exposed metal layer surface by using a vapor corrosion inhibitor in process of Hashim et al. as taught by Avanzino et al. because the process would enables to form a thin controllable, uniform passivating layer (sacrificial layer) on an exposed surface of the metal.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on (571) 272-1702. The fax phone number for this Group is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 (See MPEP 203.08).

A handwritten signature in black ink, appearing to read 'Thanh', with a stylized flourish extending to the right.

Thanh Nguyen
Patent Examiner
Patent Examining Group 2800